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ABSTRACT

This vocabulary covering the field of environmental pollution was compiled by the staff of the Science Information Exchange, Smithsonian Institution. The view of the approach is to include an outline-classification all physical, life, and social science aspects of environmental pollution, trying to achieve a balance in the representation of each subject area, so that an equivalent depth of entry or detail is included. Emphasis in terminology is placed on subject areas receiving heavy attention in current research. Major categories for terms are environment, pollutants, sources of pollution, effects of pollution and/or pollutants, paths of pollutants, pollution management, societal involvement with pollution, future projections, and related concepts to pollution. Three hundred and ten terms appear, but this includes duplication of specific topics under more than one classification heading, as appropriate to the context of each section of the vocabulary. (BL)

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SMITHSONIAN INSTITUTION

SCIENCE INFORMATION EXCHANGE

NOTES ON AN ENVIRONMENTAL POLLUTION VOCABULARY

This vocabulary covering the field of environmental pollution represents the work of our scientific staff. This was an interdisciplinary effort, making use of the backgrounds of five of our people (a geologist, an agronomist, an aquatic biologist, a chemist and an engineer). Although it was drawn primarily from existing topics in use at SIE, it was necessary for this group to bring relevant terms together from many different indexes in use. We depend for our subject information retrieval upon the computer coordination of subject codes from some 26,000 terms arranged in multiple (about 500) indexes employed by our 11 branches in the Science Divisions. Because of this any one index may not have all terms already arranged in outline form which may be appropriate for a given discipline.

Our staff members approached the vocabulary with the view of including in an outline-classification all physical, life and social science aspects of environmental pollution, and tried to achieve a balance in the representation of each subject area, so that an equivalent depth of entry or detail would be included. They selected neither all available terms from our indexes nor all possible arrangements of these terms. They were somewhat handicapped in not having detailed guidelines covering intended definitions, scope and relative emphases intended for the later application of the vocabulary. For this reason, we feel that our group may be of most usefulness if we may receive some "feedback" concerning which subject areas would be appropriate for further subdivision (more detailed breakout) and which areas appear to be overemphasized for the purpose at hand. For example, the pneumoconioses resulting from air pollution could be broken out in some detail where a medical research program is involved, along with contraction of the section on analytical techniques, perhaps.

One comment concerning our approach: it was elected to avoid the use of reference terms interrelating the topics in this outline of the field, because of the brevity of the word list, and because readers of such a list are likely to be knowledgeable in the field; a two-page outline of the vocabulary serves to provide an overview and orientation as to where to find topics in the arrangement. If upon review of the word list you believe that an alphabetic presentation of terms used with references to positions in the outline would be useful, we have such an arrangement which can be typed and forwarded to you.

One final caveat seems in order. Because the Exchange receives descriptions of work in progress, and does not cover previous results or the published literature, the emphasis in our terminology is placed on subject areas receiving heavy attention in the current research picture. We often find that more classic and well established sectors of a subject field receive far less attention in our project descriptions and therefore in our indexing. For this reason it is possible that our choices for relative attention in the arrangement are somewhat biased.

The final length of the word list was 310 terms, but this includes duplication of specific topics under more than one classification heading, as appropriate to the context of each section of the vocabulary. In an alphabetical version, the length would be greater due to the necessity of

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referring all specific terms to a place in the classification, even when more than one of such terms occurs in a single topic. We would appreciate any comment you may have on ways of adapting this effort more specifically to your immediate purpose by additions, deletions or modifications that seem appropriate. Please call Dr. Hersey or Dr. Foster (Code 144, Extensions 5513 and 5704 respectively) as points of contact should further discussion be indicated.

ENVIRONMENTAL POLLUTION: A PROPOSED VOCABULARY

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BRIEF OUTLINE

I. Environments

1. Air
2. Water
3. Soil

II. Pollutants

1. Solid Wastes
2. Water Pollutants
3. Air Pollutants
4. Soil Pollutants
5. Biological Organisms
6. Noise
7. Light, Glare
8. Radiation
9. Electromagnetic Waves (Long Wave Length)

III. Sources of Pollution

1. Agricultural Sources
2. Natural Sources
3. Municipal Sources
4. Industrial Sources
5. Domestic Sources
6. Outdoor Recreation Sources
7. Vehicular Sources
8. Nuclear Sources
9. Accident Sources
10. Noise Sources

IV. Effects of Pollution and/or Pollutants

1. Effects on Animals
2. Effects on Plants
3. Effects on Humans
4. Effects on Materials, Structures, Equipment & Instruments
5. Food & Feed Contamination
6. Effects on the Environment

V. Path of Pollutants

1. Pollutant Transport
2. Food Chains
3. Natural Environmental Assimilation, Self Purification

VI. Pollution Management

1. Detection & Measurement of Pollutants
2. Treatment & Control of Pollution
3. Prevention of Pollution
4. Commodity Development

VII. Societal Involvement with Pollution

1. Economics of Pollution
2. Legal Aspects of Pollution
3. Political Aspects of Pollution
4. Social Aspects of Pollution

VIII. Future Projections

IX. Related Concepts to Pollution

ENVIRONMENTAL POLLUTION: A PROPOSED VOCABULARY

Smithsonian Institution
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I. Environments

1. Air

1.1 Airsheds

1.2 Confined Areas

1.2.1 Buildings & Structures

1.2.2 Vehicles - air & spacecraft, cars, submarines, etc.

1.2.3 Other

1.3. Rural Areas

1.4 Urban Areas

1.5 Other

2. Water

2.1 Brackish, Saline, Estuarine

2.2 Freshwater

2.2.1 Conduits, Pipes, Containers, etc.

2.2.2 Groundwater, Aquifers

2.2.3 Lakes, Reservoirs & Ponds

2.2.4 Streams, Rivers & Canals

2.3 Marine, Oceanic

3. Soil

4. Other

II. Pollutants

1. Solid Wastes

aquatic drift, flotsam
chaff
demolition materials
feces
garbage
metal wastes
nuclear wastes
organic matter
other non-combustibles -- cans, bottles, furniture, etc.
paper & paper products
sewage
silt & sediments
sludge
wood wastes

2. Water Pollutants

acidity
carbonates
color
dissolved minerals & nutrients
dyes
mine wastes
nitrates
oil wastes
oily water
pesticides
petroleum wastes
phenols
phosphates
pulp wastes
radioactive nuclides
salts
sewage
stagnant water
sulfates
surfactants
suspended solids
total dissolved solids (TDS)
toxins
thermal pollution
turbidity
waste water

3. Air Pollutants

aerosols

carbon dioxide
carbon monoxide
exhausts
fallout
fog
haze
hydrocarbons
hydrogen fluoride
ice fog
nitrogen oxides
odors
organometallics
ozone
pan (peroxyacetyl nitrate)
pesticide drift
pollens & spores
settleable solids
smog
smoke
sulfur compounds
suspended dusts
terpenes
ventilation wastes
volcanic ash

4. Soil Pollutants

acidity
alkalinity
pesticides
land fills
junk yards

5. Biological Organisms

algal
bacterial
fungal
microorganisms, n.s.
higher plants, aquatic weeds
insects
nematodes
other invertebrates
protozoal
viral
vertebrates

6. Noise

7. Light, Glare

8. Radiation

TV sets
x-ray

9. Electromagnetic Waves (Long Wave Length)

III. Sources of Pollution

1. Agricultural Sources

1.1 Agricultural Chemicals

1.1.1 Fertilizers

1.1.2 Pesticides

1.2 Animal Wastes - manure, feedlot runoff

1.3 Plant Wastes, Crop Wastes

1.4 Soil Erosion

1.4.1 Sheet, Rill, or Gully Erosion - silt, sediments

1.4.2 Wind Erosion - dust storms

2. Natural Sources

2.1 Forests - terpenes, debris

2.2 Inversions

2.3 Photoactivation Products

2.4 Radioactive Rocks or Rock Formations

2.5 Saline Intrusion

2.6 Vegetation - pollen, spores, seeds, weeds

2.7 Volcanos - gases, ashes

2.8 Wash-out

2.9 Wildlife - feces, carcasses, etc.

3. Municipal Sources

3.1 Engine & Motor Exhausts

3.2 Garbage & Refuse

3.3 Incinerators

3.4 Refuse Dumps, Sanitary Fills, Landfills, Disposal Fields, Junkyards

3.5 Sewage

III. Sources of Pollution (cont'd)

3. Municipal Sources (continued)

3.6 Sludge

3.7 Smoke Stacks, Chimneys

3.8 Storm Runoff

4. Industrial Sources

4.1 Atomic Plants (Nuclear Reactors, Radioactive Materials Processing)

4.2 Canneries

4.3 Chemical Manufacture

4.4 Construction

4.5 Distilleries

4.6 Fertilizer Plants

4.7 Food Processing

4.8 Metal Works, Metal Pickling, Iron & Steel Works

4,9 Mineral Processing, Refining Processes

4.10 Petroleum Industry

4.11 Power Plants

4.12 Pulp & Paper Mills, Kraft Mill Wastes

4.13 Slaughter Houses, Tanneries, Rendering Plants

4.14 Surface Mining, Strip Mining, Spoil Banks

4.15 Textile Mills

5. Domestic Sources

5.1 Chinmeys

5.2 Detergents

5.3 Incinerators, Trash Burning

5.4 Refuse Dumps

5.5 Sewage

5.6 TV sets

III. Sources of Pollutants (cont'd)

6. Outdoor Recreation Sources

6.1 Boat Discharges

6.2 Facility Wastes - from bathhouses, docks, etc.

6.3 Waste Discard, Litter

7. Vehicular Sources

7.1 Auto Junkyards

7.2 Discarded Wastes, Litter

7.3 Discharges, Oil Leaks, etc.

7.4 Exhausts - car, bus, train, aircraft, trucks. missiles, etc.

8. Nuclear Sources

8.1 Contaminated Byproducts

8.2 Cooling Water

8.3 Fallout

8.4 Fuel Wastes

8.5 Underground Explosions

9. Accident Sources

9.1 Explosions

9.2 Fires

9.3 Leakage

9.4 Pipe-line Breakage

9.5 Plane Crashes

9.6 Ship Wrecks

9.7 Spillage

9.8 Tanker Wreckage

10. Noise Sources

10.1 Aircraft, Sonic Booms

10.2 Household Noises

10.3 Industrial Noises

III. Sources of Pollutants (cont'd)

10. Noise Sources (continued)

10.4 Transportation Noises

10.5 Urban Noises

IV. Effects of Pollution and/or Pollutants

1. Effects on Animals

1.1 Behavioral Patterns

1.2 Disease Transmission

1.3 Malformations

1.4 Population Alteration

1.4.1 Migration

1.4.2 Mortality

1.4.3 Reproduction

1.5 Disorders: Respiratory, Gastrointestinal, etc.

2. Effects on Plants

2.1 Appearances

2.2 Discoloration

2.3 Disease

2.4 Growth Inhibition & Malformation

2.5 Insect Infestations

2.6 Phytotoxicity

2.7 Yield Reduction

3. Effects on Humans

3.1 Disease Transmission

3.2 Minor Symptoms

3.2.1 Discomfort - noise, etc.

3.2.2 Eye Irritations

3.2.3 Skin Irritations

IV. Effects of Pollution and/or Pollutants (cont'd)

3. Effects on Humans (continued)

3.3 Morbidity Rates

3.4 Mortality Rates

3.5 Occupational Hazards

3.6 Psychological Effects

3.7 Disorders: Respiratory, Gastrointestinal, etc.

4. Effects on Materials, Structures, Equipment & Instruments

4.1 Breakage

4.2 Corrosion

4.3 Deterioration

4.4 Discoloration

4.5 Fouling

4.6 Pitting

5. Food and Feed Contamination

5.1 Appearance

5.2 Organoleptic Properties

5.3 Physical Contaminants

5.4 Spoilage, Decay

5.5 Toxins & Residues

6. Effects on the Environment

6.1 Erosion

6.2 Eutrophication

6.3 Greenhouse Effect

6.4 Loss of Aesthetic Values

6.5 Malenclaves

V. Path of Pollutants

1. Pollutant Transport

1.1 Convection

1.2 Circulation

1.3 Currents

1.4 Drift

1.5 Infiltration

1.6 Leaching

1.7 Lofting

1.8 Seepage

1.9 Slides

1.10 Translocation

2. Food Chains

3. Natural Environmental Assimilation, Self Purification

3.1 Aeration

3.2 Degradation

3.2.1 Biodegradation

3.2.2 Chemical Degradation

3.2.3 Physical Degradation

3.3 Diffusion

3.4 Dilution

3.5 Dispersion

VI. Pollution Management

1. Detection & Measurement of Pollutants

1.1 Biological Analysis

1.1.1 Biological Oxygen Demand (BOD)

1.1.2 Bioassay Techniques

1.1.3 Biological Indicators

VI. Pollution Management (cont'd)

1. Detection & Measurement of Pollutants (continued)

1.2 Chemical Analysis

1.2.1 Chemical Oxygen Demand (COD)

1.2.2 Chromatography

1.2.3 Colorimetry

1.2.4 Electrophoresis

1.2.5 ESR (Electron Spin Resonance)

1.2.6 Fluorometry

1.2.7 Neutron Activation Analysis

1.2.8 Nuclear Magnetic Resonance (NMR)

1.2.9 pH Determinations

1.2.10 Photometry

1.2.11 Polarographic Analysis

1.2.12 Radiochemical Analysis

1.2.13 Spectrophotometry

1.2.14 Spectroscopy

1.2.15 Trace Analysis

1.3 Physical Analysis

1.3.1 Adhesion

1.3.2 Buoyancy

1.3.3 Density

1.3.4 Gradation

1.3.5 Opacity

1.3.6 Particle Size

1.3.7 Solubility

1.3.8 Specific Gravity

1.3.9 Thermal Properties

VI. Pollution Management (Cont.)

1. Detection & Measurement of Pollutants (Cont.)

1.3 Physical Analysis (Cont.)

1.3.10 Turbidity

1.3.11 Volatility

1.4 Monitoring

1.5 Remote Sensing

1.6 Sample Collecting

2. Treatment & Control of Pollution

2.1 Solid Waste Disposal

2.1.1 Collection, Transport & Handling

2.1.2 Burial

2.1.3 Deep Sea Disposal

2.1.4 Drying

2.1.5 Dumps, Junkyards, etc.

2.1.6 Incineration, Burning

2.1.7 Landfills, Sanitary Fills, etc.

2.2 Water Treatments & Waste Water Treatments

2.2.1 Biological Treatment

2.2.1.1 Aerobic

2.2.1.2 Algae

2.2.1.3 Anaerobic

2.2.1.4 Biodegradation

2.2.1.5 Digestion

2.2.1.6 Fermentation

2.2.2 Chemical Treatment

2.2.2.1 Chemical Degradation - demineralization, denitrification

2.2.2.2 Disinfection - chlorination, fluoridation, etc.

2.2.2.3 Electrochemical - electrodialysis

VI. Pollution Management (Cont.)

2. Treatment & Control of Pollution (Cont.)

2.2 Water Treatments & Waste Water Treatments (Cont.)

2.2.3 Physical Treatment, Separation Techniques

2.2.3.1 Adsorption

2.2.3.2 Augmentation (low-flow augmentation)

2.2.3.3 Coagulation

2.2.3.4 Desalination

2.2.3.5 Destratification

2.2.3.6 Drying, Dewatering

2.2.3.7 Filtration

2.2.3.8 Flocculation

2.2.3.9 Foam Fractionation

2.2.3.10 Freezing

2.2.3.11 Precipitation

2.2.3.12 Sedimentation

2.2.3.13 Stratification

2.2.4 Processing Plant Systems

2.2.4.1 Digestion Tanks

2.2.4.2 Injection Tanks

2.2.4.3 Pilot Plants

2.2.4.4 Process Design

2.2.4.5 Stages of Treatment

2.2.4.5.1 Pre-treatment

2.2.4.5.2 Primary Treatment

2.2.4.5.3 Secondary Treatment

2.2.4.5.4 Tertiary Treatment

VI. Pollution Management (Cont.)

2. Treatment & Control of Pollution (Cont.)

2.2 Water Treatments & Waste Water Treatments (Cont.)

2.2.5 Radiation Treatment

2.2.5.1 Corona Discharge

2.2.5.2 Ultraviolet

2.2.6 Self Purification, Natural Assimilation

2.2.7 Sludge Treatment

2.2.7.1 Activation

2.2.7.2 Aeration

2.2.7.3 Digestion

2.2.7.4 Disposal

2.2.7.4.1 Burial

2.2.7.4.2 Lagoons

2.2.7.4.3 Landfills

2.2.7.5 Underground Storage

2.3 Air Pollution Control & Abatement

2.3.1 Chemical Treatment

2.3.1.1 Fuel Purification

2.3.1.2 Ion Exchange

2.3.1.3 Odor Removal

2.3.1.4 Weather Modification

2.3.2 Physical Treatment

2.3.2.1 Adsorption

2.3.2.2 Filters & Screens

2.3.2.3 Precipitators

2.3.2.4 Scrubbers

2.3.2.5 Separators

2.3.2.6 Settling Chambers

VI. Pollution Management (Cont.)

2. Treatment & Control of Pollution (Cont.)

2.3 Air Pollution Control & Abatement (Cont.)

2.3.3 Radiation

2.3.3.1 Disinfection

2.3.3.2 Sterilization

2.3.4 Ventilation

2.4 Soil Pollution Control

2.4.1 Drainage Control

2.4.2 Flood Control

2.4.3 Mulches

2.4.4 Soil Amendments

2.4.5 Soil Sterilants

2.4.6 Tillage Techniques

2.5 Biological Organism Control

2.5.1 Biological Control

2.5.2 Chemical Control, Pesticides

2.5.3 Cultural Control

2.5.4 Physical Control, Mechanical Control

2.5.5 Integrated Control Measures

2.6 Noise Abatement

2.7 Glare & Light Control

2.8 Radiation & Magnetic Shielding

3. Prevention of Pollution

3.1 Combustion Engine Design

3.2 Conservation Techniques

3.3 Educational Efforts

3.4 Legislation

3.5 Location of Facilities (and pollution source)

VI. Pollution Management (Cont.)

3. Prevention of Pollution (Cont.)

3.6 Packaging & Storage

3.7 Paints, Coverings, Wrappings

3.8 Pretreatments

3.9 Quarantine

3.10 Tolerance Standards

4. Commodity Development

4.1 Chemical Recovery

4.1.1 Asphalts

4.1.2 Fertilizers

4.1.3 Fuels

4.1.4 Pesticides

4.1.5 Other

4.2 Compost, Soil Amendments

4.3 Construction Materials

4.4 Food Source

4.4.1 Domestic Animal Feeds

4.4.2 Fish Rations

4.4.3 Other

4.5 Water Reuse

4.5.1 Irrigational Water

4.5.2 Potable Water

4.5.3 Thermal Water Heating

VII. Societal Involvement with Pollution

1. Economics of Pollution

1.1 Costs

1.1.1 of Control

1.1.2 of Prevention

1.1.3 of Relocation

1.1.4 of Renovation

1.1.5 of Treatment

1.1.6 Cost Trends

1.2 Gains from By-product Development

1.3 Losses Due to Pollution

1.3.1 Condemnation

1.3.2 Animal Mortality

1.3.3 Decreased Efficiency

1.3.4 Depreciation

1.3.5 Lowered Animal Productivity

1.3.6 Lowered Plant Yield

1.3.7 Reduced Sales Appeal

1.4 Other

2. Legal Aspects of Pollution

2.1 Legislation

2.2 Enforcement

2.3 Legal Action

2.4 Standards of Acceptance, Tolerance, etc.

2.4.1 Ordinances - time, operational control, etc.

2.4.2 Pesticide Tolerances

2.4.3 Water Standards

VII. Societal Involvement with Pollution (Cont.)

3. Social Aspects

3.1 Attitudes, Acceptance, etc.

3.2 Educational Efforts

3.3 Health Hazard Concern

4. Political Implications

VIII. Future Projections

1. Long-term Planning

2. Short-term Planning

IX. Related Concepts to Pollution

1. Atomic Warfare.

2. Biological Warfare

3. Chemical Warfare

4. Extraterrestrial Pollution

5. Over-crowding